IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Jeffrey R. Thomas et al.	§	Confirmation No.:	9675
Application No.: 09/995,037	§	Group Art Unit:	1793
Filed: November 26, 2001	§	Examiner:	Ip, Sikyin
For: ON-SITE INDUCTION HEATING METHOD AND APPARATUS	§	Atty. Docket:	ITWO:0023/SWA/EUB 13224

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March 9, 2009	/Lee Eubanks/
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APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal electronically filed and received by the Office on January 8, 2009.

1. REAL PARTY IN INTEREST

The real party in interest is Illinois Tool Works Inc., the Assignee of the above-referenced application by virtue of the Assignment recorded at reel 012331, frame 0246, and recorded on November 26, 2001. Consequently, Illinois Took Works Inc. will be directly affected by the Board's decision in this Appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any other appeals or interferences related to this appeal. The undersigned is Appellants' legal representative in this appeal.

3. STATUS OF CLAIMS

Claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94 are currently pending, are currently under final rejection, and are the subject of this appeal. Claims 7, 9-46, 48-50, 56, 63, 88-90, 95, and 96 were previously canceled by Appellants and are not subject to the instant appeal.

4. STATUS OF AMENDMENTS

The instant claims have not been amended subsequent to the Final Office Action mailed November 12, 2008. Consequently, there are no outstanding amendments to be considered by the Board.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to the field of induction heating and, more specifically, to induction heating systems for heating a workpiece at a worksite. *See, e.g.*, Application, page 1, lines 5-7. The present application contains six independent claims, namely claims 1, 47, 57, 68, 79, and 87, all of which have been improperly rejected and, thus, are subject to this appeal. The subject matter of the independent claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable induction heating system (e.g., 50). *See, e.g., id.*, page 7, lines 12-16; FIG. 1. The induction heating system includes a power source (e.g., 70) electrically coupleable to a fluid-cooled induction heating cable (e.g., 56) and operable to produce a varying magnetic field (e.g., 66), and a programmable power source controller (e.g., 72) coupled to the power source for regulating the power conversion. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 4-6, 19-20; FIGS. 1 and 2. The induction heating system further includes a cooling unit (e.g., 74) fluidically coupleable to the fluid-cooled induction heating cable for providing a cooling

fluid (e.g., 104) through the fluid-cooled induction heating cable and around a workpiece (e.g., 52) to cool the fluid-cooled induction heating cable. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 19-20; page 9, lines 3-5; page 10, line 20 – page 11, line 13; FIGS. 1 and 4. Additionally, the cooling unit is configured to cooperate with at least the fluid-cooled induction heating cable to provide a single continuous cooling path (see, e.g., supply path 110, induction heating cable 56, return path 112) operable to dissipate heat from the fluid-cooled induction heating cable and from an electrical lead (e.g., 62) extending from the portable induction heating system to the fluid-cooled induction heating cable. *See, e.g., id.*, page 7, line 20 – page 8, line 2; page 11, lines 8-13; FIG. 4.

With respect to the aspect of the invention set forth in independent claim 47, discussions of the recited features of claim 47 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable heating system (e.g., 50) including a power source (e.g., 70) operable to apply output power to an electrical pathway to inductively heat a workpiece (e.g., 52), wherein the electrical pathway includes an induction heating cable (e.g., 56) adjacent the workpiece, a supply path (e.g., 110) from the portable heating system to the induction heating cable, and a return path (e.g., 112) from the induction heating cable to the portable heating system. *See, e.g., id.*, page 7, line 12 – page 8, line 2; page 11, lines 7-14; FIGS. 1 and 4. The system also includes a power source controller (e.g., 72) operable to control the heating of a workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece, and a cart (e.g., 75) operable to transport the power source and power source controller to the workpiece. *See, e.g., id.*, page 8, line 16 – page 9, line 5; FIG. 1. The system further includes a cooling unit (e.g., 74) disposed on the cart and operable to provide a flow of cooling fluid (e.g., 104). *See, e.g., id.*, page 8, lines 19-20; page 9, lines 3-5; page 10, line 20 – page 11, line 17; FIGS. 1 and 4. Additionally, the system includes the induction heating cable, which is a fluid-cooled induction heating cable that cooperates with the cooling unit to form at least a portion of a single cooling pathway that is configured to generally extend along the supply path and

the return path of the electrical pathway to remove heat therefrom. *See, e.g., id.*, page 7, line 20 – page 8, line 2; page 11, lines 8-13; FIG. 4.

Regarding the aspect of the invention set forth in independent claim 57, discussions of the recited features of claim 57 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable induction heating system (e.g., 50) including a power source (e.g., 70) electrically coupleable to a portable fluid-cooled induction heating cable (e.g., 56) and operable to provide output power to produce a varying magnetic field (e.g., 66), and a programmable controller (e.g., 72) operable to control induction heating. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 4-6, 19-20; FIGS. 1 and 2. The system further includes a cooling unit (e.g., 74) fluidically connected to the fluid-cooled induction heating cable to cool the fluid-cooled induction heating cable via a cooling fluid (e.g., 104), wherein the cooling unit dissipates heat in the cooling fluid. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 19-20; page 9, lines 3-5; page 10, line 20 – page 11, line 13; page 12, lines 11-14; FIGS. 1 and 4. The system also includes a flow switch (e.g., 282) coupled to the programmable controller, wherein the flow switch is configured to detect the cooling fluid returning from the fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid returning from the fluid-cooled induction heating cable is below a threshold amount. *See, e.g., id.*, page 23, lines 4-12; FIG. 14.

With regard to the aspect of the invention set forth in independent claim 68, discussions of the recited features of claim 68 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable induction heating system (e.g., 50) including a power source (e.g., 70) operable to provide output power to inductively heat a workpiece (e.g., 52), and a temperature controller (e.g., 72) operable to control the induction heating of the workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece. *See, e.g., id.*, page 7,

lines 12-16; page 8, lines 4-7; page 8, line 19 – page 9, line 5; FIGS. 1 and 4. The system further includes a cart (e.g., 75) operable to transport the power source and temperature controller to the workpiece. *See, e.g., id.*, page 8, lines 16-20; FIG. 1. The system also includes a flow switch (e.g., 282) coupled to the temperature controller, wherein the flow switch is configured to detect cooling fluid received from a fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount. *See, e.g., id.*, page 23, lines 4-12; FIG. 14.

With respect to the aspect of the invention set forth in independent claim 79, discussions of the recited features of claim 79 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable induction heating system (e.g., 50) including a power source (e.g., 70) electrically coupleable to a fluid-cooled induction heating cable (e.g., 56) and operable to produce a varying magnetic field (e.g., 66) in cooperation with the fluid-cooled induction heating cable, and a programmable power source controller (e.g., 72) coupled to the portable power source for regulating the power conversion. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 4-6, 19-20; FIGS. 1 and 2. The system also includes a cooling unit (e.g., 74) fluidically connected to the fluid-cooled induction heating cable to cool the fluid-cooled induction heating cable, wherein the cooling unit recycles cooling fluid (e.g., 104) received from the fluid-cooled induction heating cable to the fluid-cooled induction heating cable. *See, e.g., id.*, page 8, lines 19-20; page 9, lines 3-5; page 10, line 20 – page 11, line 17; page 12, lines 11-14; FIGS. 1 and 4. Additionally, the system includes a flow switch (e.g., 282) coupled to the programmable power source controller, wherein the flow switch is configured to detect the cooling fluid received from the fluid-cooled induction heating cable and to communicate with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount. *See, e.g., id.*, page 23, lines 4-12; FIG. 14.

Regarding the aspect of the invention set forth in independent claim 87, discussions of the recited features of claim 87 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a portable heating system (e.g., 50) including a power source (e.g., 70) operable to apply output power to inductively heat a workpiece (e.g., 52) via a fluid-cooled induction heating cable (e.g., 56), and a controller (e.g., 72) operable to control the heating of the workpiece in response to programming instructions for producing a desired temperature profile in the workpiece. *See, e.g., id.*, page 7, lines 12-18; page 8, lines 4-7; page 8, line 19 – page 9, line 5; FIGS. 1 and 4. The system also includes a cooling unit (e.g., 74) configured for fluid communication with the fluid-cooled induction heating cable, the cooling unit and fluid-cooled induction heating cable cooperating to produce a closed-loop for recycling cooling fluid (e.g., 104), and a cart (e.g., 75) operable to transport the power source, cooling unit, and controller to the workpiece. *See, e.g., id.*, page 8, lines 16-20; page 9, lines 3-5; page 10, line 20 – page 11, line 17; page 12, lines 11-14; FIGS. 1 and 4. Further, the system includes a flow switch (e.g., 282) coupled to the controller, wherein the flow switch is configured to detect the cooling fluid received from the fluid-cooled induction heating cable and to effect communication with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount. *See, e.g., id.*, page 23, lines 4-12; FIG. 14.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 1-6, 8, 47, and 51-55 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-30 of U.S. Patent No. 6,727,483 to Thomas et al. ("the '483 patent").

Second Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 57-62, 64-87, and 91-94 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-30 of the '483 patent in view of U.S. Patent No. 2,359,058 to Somes ("the Somes reference").

Third Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-28 of U.S. Patent No. 7,015,439 to Thomas et al. ("the '439 patent").

Fourth Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94 under 35 U.S.C. § 103 as unpatentable over U.S. Patent No. 3,403,240 to Henderson et al. ("the Henderson et al. reference") in view of U.S. Patent No. 5,430,274 to Couffet et al. ("the Couffet et al. reference"), U.S. Patent No. 4,058,696 to Antier et al. ("the Antier et al. reference"), and U.S. Patent No. 5,198,053 to Duncan ("the Duncan reference").

Fifth Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 57-62, 64-87, and 91-94 under 35 U.S.C. § 103(a) as unpatentable over the Henderson et al., Couffet et al., Antier et al., and Duncan references, in further view of the Somes reference.

Sixth Ground of Rejection for Review on Appeal:

Whether the Examiner erred in rejecting claims 79-87 and 91-94 under 35 U.S.C. § 103(a) as unpatentable in view of U.S. Patent No. 5,874,713 to Cydzik et al. ("the Cydzik et al. reference").

7. **ARGUMENT**

As discussed in detail below, the Examiner has failed to establish a *prima facie* case of unpatentability of the pending claims, and has thus erred in rejecting these claims. Accordingly, Appellants respectfully request full and favorable consideration by the Board, and reversal of the Examiner's improper rejections.

A. **Ground of Rejection No. 1:**

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection, in which the Examiner improperly rejected claims 1-6, 8, 47, and 51-55 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-30 of the '483 patent.

The Final Office Action mailed November 12, 2008, fails to include the minimum factual and legal analysis necessary to establish a *prima facie* case that the present claims are unpatentable under the doctrine of obviousness-type double patenting in view of claims 1-30 of the '483 patent. A proper analysis leading to an obviousness-type double patenting rejection should parallel that of a 35 U.S.C. § 103 obviousness determination. Manual of Patent Examining Procedure § 804. Thus, the burden of establishing a *prima facie* case of obviousness-type double patenting falls on the Examiner. *See Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). To establish such a *prima facie* case, the Examiner must not only show that the proposed modification includes all of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). The Examiner has failed to provide such a showing and, consequently, has erred in rejecting the instant claims.

Particularly, in the Final Office Action, the Examiner stated his rationale for this rejection as: "Although the conflicting claims are not identical, they are not patentably distinct from each other because the claimed portable induction components such as a

power source and coupleable cooling unit are overlapped by portable induction components." Final Office Action mailed November 12, 2008, page 2; *see* Office Action mailed August 23, 2007, pages 2-3. This conclusory statement, absent a reasonable explanation, fails as a matter of law to support the present rejection. While the Examiner has provided little in the way of specific rationale for the rejection, certain elements recited by the claims of the present application and not addressed by the Examiner are provided below by way of example. It is noted, however, that the Examiner's wholesale rejections of large groups of claims with little to no explanation has resulted in a proportionally large number of errors on the part of the Examiner, and that the errors discussed below, and elsewhere within this Appeal Brief, should in no way be construed as an exhaustive list of the Examiner's errors.

Claims 1-3, 5, and 6

Independent claim 1 is believed to be representative of claims 1-3, 5, and 6. Appellants respectfully assert that claim 1 recites elements that are not rendered obvious by claims 1-30 of the '483 patent. For instance, claim 1 recites "a *single continuous cooling path* operable to dissipate heat from the fluid-cooled induction heating cable *and* from an electrical lead extending from the portable induction heating system to the fluid-cooled induction heating cable." Claim 1 also recites "a programmable power source controller coupled to the power source for regulating the power conversion." Appellants respectfully submit that the Examiner's general suggestion that claims 1-30 of the '483 patent disclose a power source and a coupleable cooling unit does not render obvious the programmable power source controller or the single continuous cooling path of claim 1. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of, and has erred in rejecting, claims 1-3, 5, and 6 on the grounds of obviousness-type double patenting in view of claims 1-30 of the '483 patent.

Claims 47 and 52-55

Independent claim 47 is believed to be representative of this subset of claims. Appellants respectfully assert that independent claim 47 also recites elements that are not

rendered obvious by claims 1-30 of the '483 patent. For instance, claim 47 recites a "fluid-cooled induction heating cable that cooperates with the cooling unit to form at least a portion of a single cooling pathway that is configured to generally extend along the supply path and the return path of the electrical pathway to remove heat therefrom." Claim 47 also recites a "power source controller operable to control the heating of a workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece." Appellants respectfully submit that the Examiner's general suggestion that claims 1-30 of the '483 patent disclose a power source and a coupleable cooling unit does not render obvious these recitations. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of, and has erred in rejecting, claim 47 and 52-55 on the grounds of obviousness-type double patenting in view of claims 1-30 of the '483 patent.

Claim 4

Claim 4 recites that "the power source controller is operable to control power from the power source to produce a desired temperature profile in the workpiece." Appellants respectfully submit that this recitation is not obvious in view of claims 1-30 of the '483 patent. Further, while generally grouping claim 4 in with the rejection of twelve other claims (i.e., claims 1-3, 5, 6, 8, 47, and 51-55), the Examiner has not provided a *scintilla* of evidence or explanation suggesting that this recitation is obvious in view of claims 1-30 of the '483 patent. *See* Final Office Action mailed November 12, 2008, page 2 (in which the only explanation provided by the Examiner is that the claims are not patentably distinct because "the claimed portable induction components such as a power source and coupleable cooling unit are overlapped by portable induction heating components"). Accordingly, the Examiner has not established a *prima facie* case of unpatentability of claim 4 on the grounds of obviousness-type double patenting and has thus erred in rejecting this claim.

Claims 8 and 51

Claims 8 and 51 each recite "a temperature feedback device operable to provide an electrical signal representative of workpiece temperature." Appellants respectfully submit that this recitation is not obvious in view of claims 1-30 of the '483 patent. While generally grouped with other claims, the Examiner failed to provide any explanation as to how he believes that this recitation is obvious in view of claims 1-30 of the '483 patent. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of claims 8 and 51 under obviousness-type double patenting and has erred in rejecting these claims.

B. **Ground of Rejection No. 2:**

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection, in which the Examiner improperly rejected claims 57-62, 64-87, and 91-94 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-30 of the '483 patent in view of the Somes reference.

The Final Office Action mailed November 12, 2008, fails to include the minimum factual and legal analysis necessary to establish a *prima facie* case that the present claims are unpatentable under the doctrine of obviousness-type double patenting in view of claims 1-30 of the '483 patent and the Somes reference. Particularly, in the Final Office Action, the Examiner merely stated that claims 1-30 of the '483 patent disclose an induction heating system comprising a power source and a cooling unit, that the Somes reference teaches a flow switch "that deenergized (shut off) induction heating coil when said coil is not properly cooled," and that "using flow switch in induction heating system to insure the induction heating coil is properly cooled is contemplated within ambit of ordinary skill artisan." Final Office Action mailed November 12, 2008, pages 2-3 (errors in original). Certain examples of elements recited by these claims and not addressed by the Examiner are provided below.

Claims 57-59, 61, 62, 66, 67, 79-81, and 83-85

For purposes of this rejection, independent claim 57 is believed to be representative of this group of claims. Appellants respectfully assert that the instant claims recite elements that are not rendered obvious by claims 1-30 of the '483 patent and the Somes reference. For instance, representative claim 57 recites "a flow switch … configured to detect the cooling fluid returning from the fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount." Claim 57 also recites "a programmable controller operable to control induction heating." Appellants submit that these elements are not rendered obvious by claims 1-30 of the '483 patent or by the Somes reference.

As to a programmable controller operable to control induction heating, the Examiner has not identified such a teaching in either claims 1-30 of the '483 patent or in the Somes reference. For this reason alone, the rejection cannot be sustained. Further, however, and as discussed below with respect to the fifth ground of rejection, although the Somes reference discloses flow responsive devices 14 and 17, neither of these devices can be reasonably equated with the flow switch recited by the instant claims. Particularly, the flow responsive devices 14 and 17 are not configured to "detect the cooling fluid returning from the fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount," as recited in claim 57. Consequently, for at least these reasons, Appellants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness-type double patenting as to these claims, and that the instant rejection by the Examiner is erroneous.

Claims 68-71, 73-78, 87, and 92-94

With respect to this ground of rejection, independent claim 68 is believed to be representative of this subset of claims. Appellants respectfully assert that the instant claims recite elements that are not rendered obvious by claims 1-30 of the '483 patent

and the Somes reference. For instance, representative claim 68 recites "a flow switch … configured to detect cooling fluid received from a fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount." Claim 68 also recites "a temperature controller operable to control the induction heating of the workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece." Appellants submit that these elements are not rendered obvious by claims 1-30 of the '483 patent or by the Somes reference.

As to the temperature controller operable to control induction heating and to produce a desired temperature profile in the workpiece, the Examiner has not identified such a teaching in either claims 1-30 of the '483 patent or in the Somes reference. Additionally, as noted above, and as discussed below in greater detail with respect to the fifth ground of rejection, although the Somes reference discloses flow responsive devices 14 and 17, neither of these devices are configured to "detect cooling fluid received from a fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount," as recited in claim 68. As such, the Examiner has failed to establish a *prima facie* case of obviousness-type double patenting of these claims, and has thus erred in making this rejection.

Claims 60 and 82

For the present rejection, claim 60 is believed to be representative of claims 60 and 82. Claim 60 recites that "the programmable controller is operable to control induction heating to produce a desired temperature profile in a workpiece." Appellants respectfully submit that this recitation is not obvious in view of claims 1-30 of the '483 patent or the Somes reference. Further, other than a general grouping by the Examiner of claims 60 and 82 in the obviousness-type double patenting rejection of their respective parent claims (independent claims 57 and 79), the Examiner has not identified *any* explanation as to why he believes that these claims are obvious in view of those of the

'483 patent and the Somes reference. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of claims 60 and 82 on the grounds of obviousness-type double patenting and has thus erred in rejecting these claims.

Claims 64, 65, 72, 86, and 91

For the instant rejection, claim 64 is believed to be representative of this subset of claims. Claim 64 recites "a temperature feedback device operable to provide an electrical signal representative of a workpiece temperature." Appellants respectfully submit that this recitation is not obvious in view of claims 1-30 of the '483 patent or the Somes reference. Further, while generally grouped with other claims, the Examiner has failed to provide any explanation as to how he believes that this recitation is obvious in view of claims 1-30 of the '483 patent or the Somes reference. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of claims 64, 65, 72, 86, and 91 under obviousness-type double patenting and has erred in rejecting these claims.

C. **Ground of Rejection No. 3:**

Appellants respectfully urge the Board to review and reverse the Examiner's third ground of rejection, in which the Examiner also improperly rejected claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94 under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 1-28 of the '439 patent.

The Final Office Action mailed November 12, 2008, fails to include the minimum factual and legal analysis necessary to establish a *prima facie* case that the present claims are unpatentable under the doctrine of obviousness-type double patenting in view of claims 1-28 of the '439 patent. Particularly, in the Final Office Action, the Examiner merely stated that the instant claims were not patentably distinct from those of the '439 patent because "the instant claimed portable induction heating components such as a power source, programmable controller (instant claims 1 and 47), and a temperature feedback device (instant claims 51-54) are overlapped by portable induction components (USPN 7015439, claim 1, for example)." Final Office Action mailed November 12,

2008, page 3 (errors in original). Even assuming, for the sake of argument, that this statement by the Examiner is correct, Appellants respectfully note that a claim is not proved obvious by the mere fact that some elements in the claims may be similar to those taught elsewhere. Certain examples of elements recited by the instant claims and not addressed by the Examiner are provided below.

Claims 1-6, 8, 47, and 51-55

For the present rejection, Appellants submit that independent claim 1 is representative of this group of claims. Appellants respectfully assert that claim 1 recites elements that are not rendered obvious by claims 1-28 of the '439 patent. For instance, claim 1 recites "a cooling unit." Independent claim 1 also recites "a *single continuous cooling path* operable to dissipate heat from the fluid-cooled induction heating cable *and* from an electrical lead extending from the portable induction heating system to the fluid-cooled induction heating cable." Appellants respectfully submit that these elements are not rendered obvious in view of claims 1-28 of the '439 patent. Further, besides a bald assertion to the contrary, the Examiner has provided no explanation with respect to such recitations. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of these claims under obviousness-type double patenting in view of the '439 patent, and has erred in making this rejection.

Claims 57-62, 64-87, and 91-94

Independent claim 57 is believed to be representative of this subset of claims for purposes of this rejection. Appellants respectfully assert that independent claim 57 also recites elements that are not rendered obvious by claims 1-28 of the '439 patent. For example, claim 57 recites "a cooling unit fluidically connected to the fluid-cooled induction heating cable to cool the fluid-cooled induction heating cable via a cooling fluid, wherein the cooling unit dissipates heat in the cooling fluid." Claim 57 also recites a "a flow switch coupled to the programmable controller, wherein the flow switch is configured to detect the cooling fluid returning from the fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling

fluid returning from the fluid-cooled induction heating cable is below a threshold amount." Appellants respectfully submit that the Examiner's general suggestion that claims 1-28 of the '439 patent disclose a power source, a programmable controller, and a temperature feedback device does not render obvious (and appears to have nothing to do with) these recitations. Accordingly, the Examiner has not established a *prima facie* case of unpatentability of, and has erred in rejecting, claims 57-62, 64-87, and 91-94 on the grounds of obviousness-type double patenting in view of claims 1-28 of the '439 patent.

D. **Ground of Rejection No. 4**

Appellants respectfully urge the Board to review and reverse the Examiner's fourth ground of rejection, in which the Examiner improperly rejected claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94 under 35 U.S.C. § 103(a) as unpatentable over the Henderson et al. reference in view of the Couffet et al. reference, the Antier et al. reference, and the Duncan reference.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). In establishing a *prima facie* case for obviousness, "the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long-felt but unresolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." *KSR Int'l Co. v. Teleflex, Inc.,* 127 S. Ct. 1727, 1729 (2007) (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). It is often necessary "to look to interrelated teachings of multiple patents, the effects of demands known to the design community or present in the market place; and the background knowledge possessed by a person having ordinary skill in the art." *Id.* This analysis should be made explicit. *Id.*

Additionally, a claim having several elements is *not* proved obvious merely by demonstrating that each of its elements was known in the prior art. *Id.* In this regard, the Supreme Court recently reiterated that it is "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does…because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *Id.* As such, the obviousness inquiry does not hinge on demonstrating that elements were known in the art. Rather, the obviousness inquiry focuses on whether the claimed subject matter would have been obvious to persons having ordinary skill in the art in view of the demands and practices of the design community at the time of filing of the application. *See id.* Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985).

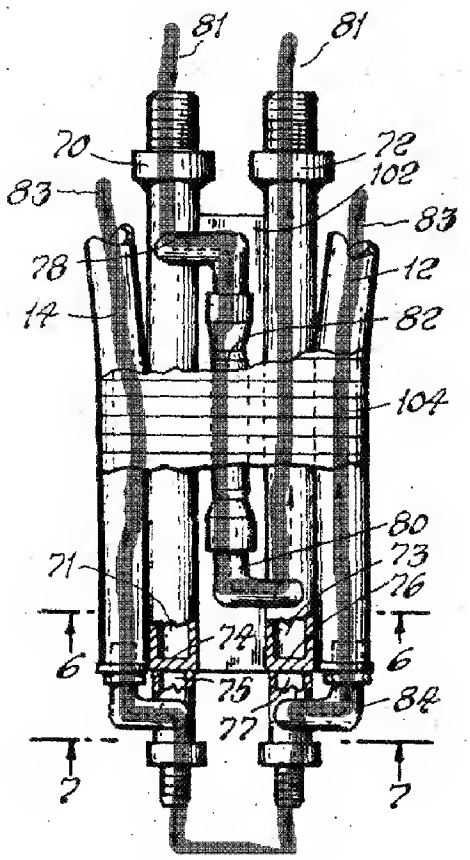
Claims 1-6, 8, 47, and 51-55

Appellants respectfully note that the Henderson et al., Couffet et al., Duncan, and Antier et al. references, even taken collectively, fail to disclose each element of independent claims 1 and 47, or their respective dependent claims 2-6, 8, and 51-55. For instance, independent claim 1 recites "a cooling unit … configured to cooperate with at least the fluid-cooled induction heating cable to provide a *single continuous cooling path* operable to dissipate heat from the fluid-cooled induction heating cable *and* from an electrical lead extending from the portable induction heating system to the fluid-cooled induction heating cable" (emphasis added). Similarly, independent claim 47 recites "a power source operable to apply output power to *an electrical pathway* … [including] an induction heating cable adjacent the workpiece, a supply path from the portable heating system to the induction heating cable, and a return path from the induction heating cable to the portable heating system" and "wherein the induction heating cable is a fluid-cooled

induction heating cable that cooperates with the cooling unit to form at least a portion of *a single cooling pathway* that is configured to generally extend along the supply path and the return path of the electrical pathway to remove heat therefrom" (emphasis added). Because the cited references fail to disclose such elements, the cited references cannot support a *prima facie* case of obviousness with respect to independent claims 1 and 47, or their respective dependent claims.

The Examiner has erroneously relied on the Henderson et al. reference as disclosing these features. As will be appreciated, the Henderson et al. reference is generally directed to an induction brazing apparatus. Henderson et al., col. 1, lines 25-30; FIG. 2. More particularly, the Henderson et al. apparatus includes cooling water conduits 12 and 14, and water-cooled electrical conduits 16 and 18, that extend from a work unit 10. *Id.*, col. 2, lines 23-32. The water-cooled electrical conduits 16 and 18 extend to the handle 20, which is configured to complete a *first* cooling pathway by fluidly connecting the electrical conduits 16 and 18. *See id.*, col. 3, lines 5-21 ("leads 16 and 18 are connected respectively in the same manner to tubular elements 70 and 72"); FIG. 5. The water conduits 12 and 14 extend from the work unit 10 to an induction heating element 22. *Id.*, col. 3, lines 26-37. Notably, the reference explicitly states that "[s]eparate cooling fluid for the induction heating element 22 is supplied from conduits 12 and 14 ...." *Id.* It is, thus, evident that the water conduits 12 and 14 form a portion of a *second* cooling pathway that includes the induction heating element 22. For the Board's convenience, these two separate and distinct pathways are indicated in the annotated Fig. 5 of the Henderson et al. reference provided immediately below:

from lead 18 to lead 16



to induction heating element 22 from induction heating element 22

From these passages and the annotated drawing above, it is clear that the *first cooling pathway* (generally indicated by arrows 81) including conduits 16 and 18 removes heat from the electrical leads to the handle 20, while it is the *second cooling pathway* (generally indicated by arrows 83) that removes heat from the induction heating element 22 itself. *See id.*, FIG. 2. This is in direct opposition to the recitations of independent claims 1 and 47, which generally recite a *single cooling path* that includes a fluid-cooled induction heating cable and that operates to dissipate heat from *both the fluid-cooled induction heating cable and an electrical lead extending between the induction heating cable and the portable induction heating system*. For this reason, the

Henderson et al. reference (which discloses two independent cooling paths for the electrical leads and the induction heating element 22, respectively) cannot be logically considered to disclose the *single* cooling path recited by the instant claims.

Indeed, while generally relying on the Henderson et al. reference as disclosing the recited single cooling path, the Examiner has not indicated where he believes the Henderson et al. reference makes such a disclosure. Moreover, from the Final Office Action, it appears that the Examiner has based his rejection on the erroneous notion that he does not actually have to consider the language of the claims. Rather, it appears that the Examiner has decided that FIG. 4 of the present application merely discloses circulating a cooling fluid, and that any disclosure of a circulating cooling fluid is sufficient in establishing a *prima facie* case of unpatentability (regardless of the claim language). *See* Final Office Action mailed November 12, 2008, page 8 (second paragraph). In short, the Examiner has refused to address each element of the instant claims. This is highly improper, and cannot stand.

Additionally, Appellants respectfully submit that the Duncan, Antier et al., and Couffet et al. references fail to obviate this deficiency, and the Examiner has not relied on these references as disclosing the single cooling path recited by the instant claims. Appellants respectfully submit that the Examiner has erred in failing to consider each element of the instant claims, and in failing to identify teachings of such elements in the prior art. As such, a *prima facie* case of unpatentability has not been established and the Examiner erred in rejecting the instant claims.

Claims 57-62, 64-87, and 91-94

In the Office Action, the Examiner acknowledged that the Henderson et al., Couffet et al., Antier et al., and Duncan references did not, in fact, collectively disclose each element of these claims. *See* Final Office Action mailed November 12, 2008, page 5, third paragraph (acknowledging that these references do not teach the recited flow switches (claims 57, 68, 79, and 87)), fifth paragraph (acknowledging that these

references do not disclose recycling a cooling fluid (claims 79 and 87)). It is noted that the Examiner did add fifth and sixth references (the Somes and Cydzik et al. references, respectively) to the proposed combinations in other grounds of rejection (particularly, the fifth and sixth grounds of rejection discussed below) in an effort to overcome these deficiencies. As to the present ground of rejection, however, Appellants respectfully submit (in apparent agreement with the Examiner) that the Henderson et al., Couffet et al., Antier et al., and Duncan references fail to disclose each element of claims 57-62, 64-87, and 91-94. Consequently, the present rejection of these claims as obvious in view of this combination of references, admitted to be deficient by the Examiner, is erroneous.

E. **Ground of Rejection No. 5**

Appellants respectfully urge the Board to review and reverse the Examiner's fifth ground of rejection, in which the Examiner improperly rejected claims 57-62, 64-87, and 91-94 under 35 U.S.C. § 103(a) as unpatentable over the Henderson et al., Couffet et al., Antier et al., and Duncan references, in further view of the Somes reference.

Claims 57-62 and 64-78

Appellants respectfully note that the Henderson et al., Couffet et al., Duncan, Antier et al., and Somes references, taken alone or in combination, fail to disclose each element of independent claims 57 and 68, or their respective dependent claims 58-62, 64-67, and 69-78. For instance, independent claim 57 (which is believed to be representative of this subset of claims for purposes of the present ground of rejection) recites "a flow switch ... configured to detect the cooling fluid *returning from the fluid-cooled induction heating cable* and to effect *discontinuation of* the output power when the amount of the cooling fluid returning from the fluid-cooled induction heating cable *is below a threshold amount*" (emphasis added). Because the cited references fail to disclose such elements, the cited references fail to establish a *prima facie* case of obviousness with respect to these claims, and the present rejection thereof is in error.

In the Final Office Action, the Examiner suggested that a solenoid 122, a control box 131, and a check valve 128 of the Henderson et al. reference could be equated with the recited "flow switch." While Appellants do not dispute that these elements of the Henderson et al. reference generally relate to flow control, the Examiner's assertion with respect to the Henderson et al. reference appears to ignore a substantial portion of the claim recitations regarding the flow switch. The Henderson et al. solenoid 122 actuates a valve 120 to start and stop coolant flow in the Henderson et al. apparatus. Henderson et al., col. 3, lines 65-71. Particularly, the reference states:

> The solenoid 122 is connected by line 129 and control box 131 to a control cable 130 shown in FIG. 4 which in turn is connected to the power supply motor-generator set (not shown) to actuate the valve 120 through solenoid 122 to open position and supply cooling water to the induction heating element 22 only when power is being delivered to the heating element.

Id. In other words, the solenoid 122, via the control box 131, simply opens the valve 120 when power is applied to the heating element 22, and closes the valve 120 when power is not being applied to the heating element 22.

There is no disclosure, suggestion, or even hint in the cited reference that the solenoid 122 or control box 131 somehow "detect cooling fluid," as recited in the present claims. In fact, as described in the cited reference, one skilled in the art would understand that the control box 131 detects a control signal (not cooling fluid) from a control cable 130, and the solenoid 122 detects a control signal (not cooling fluid) transmitted from the control box 131 over the line 129. Further, it is readily apparent that, in the Henderson et al. reference, the application of power to the heating element 22 by the power supply controls actuation of the solenoid 122; the solenoid 122 *does not* control the application of power to the heating element 22. As neither the solenoid 122 of the control box 131 detect cooling fluid, it is also evident that neither of these elements is configured "*to effect discontinuation of the output power when the amount of the cooling fluid* returning from the fluid-cooled induction heating cable *is below a threshold*

amount" (emphasis added). Additionally, the check valve 128 merely prevents water from flowing from a drain manifold 114 to the heating element 22; the cited reference does not teach, disclose, or even hint that the check valve 128 provides the functionality discussed above and recited in the instant claims. For at least these reasons, the solenoid 122, the check valve 128, and the control box 131 cannot be logically equated with the "flow switch" recited in the present claims.

The Examiner additionally cited the Somes reference in an ostensible attempt to remedy the above noted deficiency. The Somes reference is generally directed to an assembly including separate heating and quenching heads for inductively heating and cooling a workpiece. Somes, page 1, first column, lines 1-11. The disclosed apparatus includes a fluid-cooled inducing head 10 (including an inducing coil 23) configured to engage a separate quench head 13. *Id.*, page 1, second column, lines 42-49; page 2, first column, lines 32-37; FIGS. 1 and 2. In the Somes system, coolant is first routed into the structure via a supply passage 11 (FIG. 3), and then through an outer bore 26 (FIG. 3), a passage 27 (FIG. 3), a passage 28 (FIGS. 3 and 2, sequentially), an annular passage 29 (FIG. 2), a radial passage 30 (FIG. 2), and into a helical passage 31 (FIG. 2) in the coil 23. *Id.*, page 2, first column, lines 38-44. Once the coolant passes through the helical passage 31, it is routed through a lower passage 32 and into a central chamber 33, as illustrated in FIG. 2. *Id.*, page 2, first column, lines 44-46. The central chamber 33 contains a ball valve 35 that normally rests against a seat 36, generally causing the coolant to pass from the central chamber 33 to a central passage 34 (which is coaxial with the bore 26, as illustrated in FIGS. 2-4) and then out of the structure via an outlet passage 12 (FIG. 4). *Id.*, page 2, first column, lines 46-54. However, during a heating operation, a central projecting stem 37 of the quench head 13 pushes the ball valve 35 away from its seat 36, upon which the coolant from the inducing coil (or helical passage 31) is routed through the seat 36 and into the quench head 13, rather than returning to the outlet passage 12. *See, e.g., id.*, page 2, first column, lines 46-66; FIG. 2.

Notably, the Somes system also includes a flow responsive device 14 in the coolant supply passage 11 and a flow responsive device 17 in the coolant outlet passage 12. *Id.*, page 2, first column, lines 10-22; FIG. 5. These two devices are coupled to electrical switches 15 and 18, respectively, for opening or closing a circuit 16 that provides electrical current to the inducing head 10. *Id.* The flow device 14 is configured to close the normally-open switch 15 (allowing current to flow to the inducing head 10) only upon a sufficient flow of coolant through the supply passage 11. *See id.*, page 2, second column, lines 24-46. Conversely, the flow device 17 is configured to open the normally-closed switch 18 (stopping current from flowing to the inducing head 10) if coolant flow through the outlet passage 12 is above a certain level that indicates valve 35 is closed (i.e., that the inducing head 10 is no longer engaging the quench head 13). *See id.*

In the Final Office Action, the Examiner suggested that "Somes teaches flow switch that deenergized (shut off) induction heating coil when said coil is not properly cooled." Final Office Action mailed November 12, 2008, page 5. Appellants, however, again respectfully note that claim 57 (and, generally, the other claims of this group) recites "a flow switch … *configured to detect the cooling fluid returning from the fluid-cooled induction heating cable* and to effect *discontinuation of the output power when the amount of the cooling fluid returning from the fluid-cooled induction heating cable is below a threshold amount*" (emphasis added).

In sharp contrast, the flow sensing device 14 (and associated switch 15) of the Somes reference is upstream of the inducing head 10, does not receive coolant returning from the inducing head 10 and, thus, cannot be reasonably equated with a flow switch "configured to detect the cooling fluid returning from the fluid-cooled induction heating cable." The flow sensing device 17 (and associated switch 18) is, indeed, downstream from the inducing head 10 of the Somes system. This device 17, however, is configured such that power is *delivered* to the inducing head 10 when the amount of coolant in the outlet passage 12 (i.e., returning from the inducing head 10) is below a certain level, and

discontinues power output only when the amount of coolant returning from the inducing head 10 is *above* a certain level. In short, the flow sensing device 17 operates in a manner diametrically opposed to, and cannot be logically equated with, the flow switch recited in the instant claims. Consequently, Appellants respectfully submit that the Somes reference fails to obviate the deficiencies of the Henderson et al. reference. Further, Appellants submit that the Couffet et al., Antier et al., and Duncan references do not otherwise obviate this deficiency of both the Henderson et al. and Somes references. Because they fail to teach each and every element, these cited references do not establish a *prima facie* case of obviousness with respect to claim 57, or the remaining claims 58-62 and 64-78 of this group. Accordingly, Appellants respectfully submit that the Examiner erred in rejecting these claims.

Claims 79-87 and 91-94

In the Office Action, the Examiner acknowledged that the Henderson et al., Couffet et al., Antier et al., Duncan, and Somes references did not, in fact, collectively disclose each element of these claims. *See* Final Office Action mailed November 12, 2008, page 5, fifth paragraph (acknowledging that these references do not disclose recycling a cooling fluid (claims 79 and 87)). It is noted again that the Examiner did add a sixth reference (the Cydzik et al. reference) to the proposed combinations in the sixth ground of rejection in an attempt to remedy this deficiency, and this combination of six references is addressed below. As to the present ground of rejection, however, Appellants respectfully submit (in apparent agreement with the Examiner) that the Henderson et al., Couffet et al., Antier et al., Duncan, and Somes references fail to disclose each element of claims 79-87 and 91-94. Consequently, the present rejection of these claims as obvious in view of this combination of references, admitted to be deficient by the Examiner, is erroneous.

F. **Ground of Rejection No. 6**

Appellants respectfully urge the Board to review and reverse the Examiner's sixth ground of rejection, in which the Examiner improperly rejected claims 79-87 and 91-94

under U.S.C. § 103(a) as unpatentable over the Henderson et al., Couffet et al., Antier et al., Duncan, and Somes references in view of the Cydzik et al. reference.

Claims 79-87 and 91-94

Appellants respectfully note that the Henderson et al., Couffet et al., Duncan, Antier et al., Somes, and Cydzik et al. references, taken alone or in combination, fail to disclose each element of independent claims 79 and 87, or their respective dependent claims 80-86 and 91-94. For example, representative independent claim 79 recites "a flow switch coupled to the programmable power source controller, wherein the flow switch is configured to detect the cooling fluid received from the fluid-cooled induction heating cable and to *communicate with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount*" (emphasis added). Because the cited references fail to disclose such an element, the cited references fail to establish a *prima facie* case of obviousness with respect to claims 79-87 and 91-94.

As generally noted above with respect to the fifth ground of rejection, the Henderson et al., Couffet et al., Duncan, Antier et al., and Somes references collectively fail to disclose a flow switch "configured to detect the cooling fluid received from the fluid-cooled induction heating cable." Further, for at least the reasons also discussed above, these five references also fail to disclose a flow switch configured to "communicate with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount." The Cydzik et al. reference is not believed to obviate these deficiencies, nor does the Examiner rely on the Cydzik et al. reference for such teachings. Consequently, the rejection of claims 79-87 and 91-94 as obvious in view of the Henderson et al., Couffet et al., Duncan, Antier et al., Somes, and Cydzik et al.

references is erroneous for at least the same reasons provided above with respect to the fifth ground of rejection.

Conclusion

In view of the above remarks, Appellants respectfully submit that the Examiner has provided no supportable position or evidence that justifies the present improper rejections of, and has erred in rejecting, claims 1-6, 8, 47, 51-55, 57-62, 64-87, and 91-94. Consequently, Appellants respectfully request reversal of the present rejections. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: March 9, 2009

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8. CLAIMS APPENDIX

1. A portable induction heating system, comprising in a portable unit:

a power source electrically coupleable to a fluid-cooled induction heating cable and operable to produce a varying magnetic field;

a programmable power source controller coupled to the power source for regulating the power conversion; and

a cooling unit fluidically coupleable to the fluid-cooled induction heating cable for providing a cooling fluid through the fluid-cooled induction heating cable and around a workpiece to cool the fluid-cooled induction heating cable, wherein the cooling unit is configured to cooperate with at least the fluid-cooled induction heating cable to provide a single continuous cooling path operable to dissipate heat from the fluid-cooled induction heating cable and from an electrical lead extending from the portable induction heating system to the fluid-cooled induction heating cable.

2. The system as recited in claim 1, comprising a flexible fluid-cooled induction heating cable.

3. The system as recited in claim 1, wherein the fluid-cooled induction heating cable is coupled via connector assemblies to the power source and cooling unit.

4. The system as recited in claim 3, wherein the power source controller is operable to control power from the power source to produce a desired temperature profile in the workpiece.

5. The system as recited in claim 2, wherein the induction heating system is operable to preheat a workpiece before welding and to relieve stress from the workpiece after welding.

6. The system as recited in claim 1, comprising a wheeled cart, wherein the power source and cooling unit are disposed on the wheeled cart.

8. The system as recited in claim 1, comprising a temperature feedback device operable to provide an electrical signal representative of workpiece temperature.

47. A portable heating system, comprising in a portable unit:

a power source operable to apply output power to an electrical pathway to inductively heat a workpiece, wherein the electrical pathway includes an induction heating cable adjacent the workpiece, a supply path from the portable heating system to the induction heating cable, and a return path from the induction heating cable to the portable heating system;

a power source controller operable to control the heating of a workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece;

a cart operable to transport the power source and power source controller to the workpiece;

a cooling unit operable to provide a flow of cooling fluid, the cooling unit being disposed on the cart; and

the induction heating cable, wherein the induction heating cable is a fluid-cooled induction heating cable that cooperates with the cooling unit to form at least a portion of a single cooling pathway that is configured to generally extend along the supply path and the return path of the electrical pathway to remove heat therefrom.

51. The system as recited in claim 47, comprising a temperature feedback device operable to produce a signal representative of workpiece temperature to the power source controller.

52. The system as recited in claim 47, wherein the power source controller uses PID control.

53. The system as recited in claim 47, wherein the power source controller uses PI control.

54. The system as recited in claim 47, wherein the system is operable to raise the temperature of a workpiece to a first temperature and lower the temperature of the workpiece from the first temperature to a second temperature at a desired rate.

55. The system as recited in claim 47, comprising an insulation blanket having a visible line to enable the insulation blanket to be aligned with a weld joint.

57. A portable induction heating system, comprising in a portable unit:

a power source electrically coupleable to a portable fluid-cooled induction heating cable and operable to provide output power to produce a varying magnetic field;

a programmable controller operable to control induction heating;

a cooling unit fluidically connected to the fluid-cooled induction heating cable to cool the fluid-cooled induction heating cable via a cooling fluid, wherein the cooling unit dissipates heat in the cooling fluid; and

a flow switch coupled to the programmable controller, wherein the flow switch is configured to detect the cooling fluid returning from the fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid returning from the fluid-cooled induction heating cable is below a threshold amount.

58. The system as recited in claim 57, wherein the programmable controller comprises a plurality of visual indicators.

59. The system as recited in claim 57, wherein the fluid-cooled induction heating cable is connected via connector assemblies to the power source and cooling unit.

60. The system as recited in claim 57, wherein the programmable controller is operable to control induction heating to produce a desired temperature profile in a workpiece.

61. The system as recited in claim 57, wherein the induction heating system is operable to preheat a workpiece before welding and to relieve stress from the workpiece after welding.

62. The system as recited in claim 57, comprising a wheeled cart, wherein the power source and cooling unit are disposed on the wheeled cart.

64. The system as recited in claim 57, comprising a temperature feedback device operable to provide an electrical signal representative of a workpiece temperature.

65. The system, as recited in claim 64, wherein the electrical signal representative of the workpiece temperature from the temperature feedback device is sent to the programmable controller.

66. The system as recited in claim 57, wherein the programmable controller uses proportional-integral-derivative (PID) control.

67. The system as recited in claim 57, wherein the programmable controller uses proportional-integral (PI) control.

68. A portable induction heating system, comprising in a portable unit:

a power source operable to provide output power to inductively heat a workpiece;

a temperature controller operable to control the induction heating of the workpiece in response to programming instructions provided by a user to produce a desired temperature profile in the workpiece;

a cart operable to transport the power source and temperature controller to the workpiece; and

a flow switch coupled to the temperature controller, wherein the flow switch is configured to detect cooling fluid received from a fluid-cooled induction heating cable and to effect discontinuation of the output power when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount.

69. The system as recited in claim 68, wherein the temperature profile is configured for post-weld stress relief of the workpiece.

70. The system as recited in claim 68, comprising a fluid-cooled induction heating cable.

71. The system as recited in claim 68, comprising a cooling unit operable to provide a flow of cooling fluid, the cooling unit being disposed on the cart.

72. The system as recited in claim, 68 comprising a temperature feedback device operable to produce a signal representative of workpiece temperature to the temperature controller.

73. The system as recited in claim 68, wherein the temperature controller uses proportional-integral-derivative (PID) control.

74. The system as recited in claim 68, wherein the temperature controller uses proportional-integral (PI) control.

75. The system as recited in claim 68, wherein the system is operable to raise the temperature of a workpiece to a first temperature and lower the temperature of the workpiece from the first temperature to a second temperature at a desired rate.

76. The system as recited in claim 68, comprising an insulation blanket having a visible line to enable the insulation blanket to be aligned with a weld joint.

77. The system as recited in claim 70, wherein the fluid-cooled induction heating cable is connected via connector assemblies to the power source.

78. The system as recited in claim 71, wherein a fluid-cooled induction heating cable is connected via connector assemblies to the cooling unit.

79. A portable induction heating system, comprising in a portable unit:

a power source electrically coupleable to a fluid-cooled induction heating cable and operable to produce a varying magnetic field in cooperation with the fluid-cooled induction heating cable;

a programmable power source controller coupled to the portable power source for regulating the power conversion;

a cooling unit fluidically connected to the fluid-cooled induction heating cable to cool the fluid-cooled induction heating cable, wherein the cooling unit recycles cooling fluid received from the fluid-cooled induction heating cable to the fluid-cooled induction heating cable; and

a flow switch coupled to the programmable power source controller, wherein the flow switch is configured to detect the cooling fluid received from the fluid-cooled induction heating cable and to communicate with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount.

80. The system as recited in claim 79, comprising a flexible fluid-cooled induction heating cable.

81. The system as recited in claim 79, wherein the fluid-cooled induction heating cable is coupled via connector assemblies to the power source and cooling unit.

82. The system as recited in claim 79, wherein the programmable power source controller is operable to control power from the power source to produce a desired temperature profile in the workpiece.

83. The system as recited in claim 79, wherein the induction heating system is operable to preheat a workpiece before welding and relieve stress from the workpiece after welding.

84. The system as recited in claim 79, comprising a wheeled cart, wherein the power source and cooling unit are disposed on the wheeled cart.

85. The system as recited in claim 79, wherein a power source controller is disposed on the wheeled cart.

86. The system as recited in claim 79, comprising a temperature feedback device operable to provide an electrical signal representative of workpiece temperature.

87. A portable heating system, comprising in a portable unit:

a power source operable to apply output power to inductively heat a workpiece via a fluid-cooled induction heating cable;

a controller operable to control the heating of the workpiece in response to programming instructions for producing a desired temperature profile in the workpiece;

a cooling unit configured for fluid communication with the fluid-cooled induction heating cable, the cooling unit and fluid-cooled induction heating cable cooperating to produce a closed-loop for recycling cooling fluid;

a cart operable to transport the power source, cooling unit, and controller to the workpiece; and

a flow switch coupled to the controller, wherein the flow switch is configured to detect the cooling fluid received from the fluid-cooled induction heating cable and to effect communicate with the programmable power source controller such that the programmable power source controller discontinues power output from the power source when the amount of the cooling fluid received from the fluid-cooled induction heating cable is below a threshold amount.

91. The system as recited in claim 87, comprising a temperature feedback device operable to produce a signal representative of workpiece temperature to the controller.

92. The system as recited in claim 87, wherein the controller uses proportional-integral-derivative (PID) control.

93. The system as recited in claim 87, wherein the controller uses proportional-integral (PI) control.

94. The system as recited in claim 87, wherein the controller is operable to raise the temperature of a workpiece to a first temperature and lower the temperature of the workpiece from the first temperature to a second temperature at a desired rate.

9. **EVIDENCE APPENDIX**

None

10. **RELATED PROCEEDINGS APPENDIX**

None